

Relationship between Cognitive-Behavioral Processes and Stages of Change in Nutrient Use in Overweight Women Referring to Health Centers in Isfahan

Abstract

Background: The positive impact of post-needs assessment training on the correction of eating habits is remarkable. The aim of present study was to determine the relationship between cognitive-behavioral processes and stages of change in nutrient use in overweight women referring to health centers in Isfahan. **Materials and Methods:** The present study was a cross-sectional study conducted in 2017 during a three-month period. Using systematic random sampling, 260 overweight women referring to Isfahan comprehensive health centers were chosen. Data collection was performed by a four-part researcher-made questionnaire including demographic information form, stages of change of behavior, cognitive and behavioral processes questionnaire, and standard 168-item Food Frequency Questionnaire. After confirming its validity and reliability, it was completed by the researcher. Data were then entered N4 software perfect and analyzed using descriptive and analytical tests (ANOVA and Bonferroni Post-Hoc). **Results:** 59.30% of the subjects were in an inactive and 40.70% in an active phase. There was a significant difference with respect to different stages of change and the use of all behavior change processes ($F_4 = 11.42, p < 0.001$). The rate of using cognitive and behavioral processes increased during the nutrient change behavior ($p < 0.001$). **Conclusions:** The results of the study showed that moving away from pre-contemplation stage to maintenance phase increases the rate of using these processes that is due to the stability and improvement of changed behavior. Therefore, health plans should be designed based on the stage of the target group.

Keywords: Health behavior; nutrients, overweight, models, theoretical, women

Introduction

Obesity occurs as a result of general or local increase in the body fat. Relative risk of death among women with obesity or a body mass index more than or equal to 27 is twice more than that of lean men and women.^[1] Nowadays, obesity and overweight are among the health problems and risk factors for many diseases. According to the statistics of 2016, there have been more than 1.9 billion, 18-years-old and over adults with overweight. Of these, more than 650 million were obese.^[2] In developing countries such as India, the prevalence of overweight will double and obesity will triple from 2010 to 2040.^[3] In Iran, the prevalence of obesity and overweight was estimated to be 8.5 and 17.5%, during 2000 and 2013 respectively.^[1] Relative risk of death among women with obesity or a body mass

index more than or equal to 27 is twice more than that of lean men and women. Genetic, environmental, social, lifestyle, and psychological factors are the causes of overweight and obesity.^[4] Knowledge, beliefs, attitudes, the effect of community and friends, culture, and eating habits have significant effects on dietary behaviors, lifestyle, and overweight.^[5] Obesity and overweight cause problems such as atherosclerosis, hyperlipidemia, premature puberty, type 2 diabetes, hypertension, polycystic ovary, cardiovascular disease, endothelial dysfunction, immune deficiency disorder, mental disorders, mental health, kidney diseases, and metabolic syndrome.^[6]

Eating disorder is strongly associated with the cultural and social factors, since thinness and going on a diet are the concerns of all social classes, races, and even families.^[7]

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Moreover, people's knowledge and attitudes toward various aspects of nutrition and the function of families for choosing a proper nutrition seems to be inadequate.^[8] The first aspect of behavioral science theories argues that individuals must be motivated to perform a specific behavior and there should be no barriers related to environmental inhibition, implying the motivation of individuals in engaging themselves in behavior.^[9] One of the most important theories and models which can be used to change behavior in this study is trans-theoretical model, which has been recognized as one of methods of identification and change of diet.^[10] Using this model makes people think more about their previous behaviors and try to create new behaviors (modifying or changing their previous behaviors).^[11]

The most important construct of this model is the stages of behavior change whereby individuals go through a series of predictable steps while attempting to make a change in behavior or make a new behavior so that one can return to previous stage. These include stages of pre-thinking, precontemplation, contemplation (these three steps are called inactive phase), preparation, action, and maintenance (these three steps are called active phase).^[12] The second construct of trans-theoretical model is a 10-step process of change including strategies used by individuals to move through stages of behavior change.^[13] These processes include increased self-awareness, dramatic relief, reassessment of the environment, self-reassessment, self-abandonment, reciprocal conditioning, contingent management, stimulus control, supportive relationships, and social liberation.^[11] In a study, results showed a statistically significant relationship between stages of behavior change and fruit and vegetable consumption, self-efficacy, decision-making balance, and change processes.^[14]

Thus, as said earlier, eating disorder is associated with the cultural and social factors, as being thin and going on a diet are the concerns of all social classes, races, and even families. Indeed, processes of behavior change occur for individuals in moving through these stages of behavior change, which vary from person to person. The identification of this strategy is important, because it can tailor training programs. Therefore, the present study aimed to investigate relationship between cognitive-behavioral processes and stages of change in nutrient use of overweight women in order to paves the way toward awareness of health-care authorities with regard to the identification of trainings and also planning to achieve proper nutrition for every person and, hence, promote the health of overweight women. The present study aimed at determining the relationship between cognitive-behavioral processes and stages of change in nutrient use of overweight women referring to health centers in Isfahan.

Materials and Methods

This study, as part of a cross-sectional study design, was conducted on overweight women referring to Isfahan

Comprehensive Health Centers, between April 4 and July 6, 2017 for receiving health care services. Cluster Sampling method was used in this study. Isfahan University of Medical Sciences has two health centers from which four health networks were selected accidentally. Then, the samples were selected by systematic random sampling from "Electronic Health Record 1" system (using the latest national code number from the "Electronic health record" system every five people). Sample size was calculated to be 260 where $z = 1.96$, $p = 0.5$, $d = 0.06$. Inclusion criteria consisted of the body mass index of 25-30, age range of 30-59 years, having the ability of writing and reading, and having no specific disease which requires specific diet or medication use.

Data collection tools included questionnaire, meter, and stationary weight provided by the researcher. The questionnaire included four parts: The first part was the demographic information questionnaire (weight, height, age, occupation, education level); the second part of the researcher-made questionnaire was designed to determine stages of behavior change through the following statements: I'm not going to have a healthy diet in the next six months (pre-contemplation); no, and I'm going to have a healthy diet in the next six months (contemplation); no, but I'm going to have a healthy diet in the next six months (preparation); I have a healthy diet for a month (action); yes, I have a healthy diet for more than six months (maintenance). The participants were asked to choose the statement that best fits their situation. Determining the stages of their behavior change had a nutritional value. The scores obtained from the questionnaire were recorded, and finally data were reported as percentage and frequency. The third part of the researcher-made questionnaire, behavioral change processes in nutrition consumption, consisted of 39 five-option questions based on a 5-point Likert scale in which "never," "rarely," "sometimes," "often," and "always" were given the scores of 1 to 5, respectively. The minimum score of four was considered for the domains of awareness, facilitation, reassessment, reassessment of the environment, vehicles, stimulus control, reciprocal conditioning, helping relationships, and reinforcement of management, and the maximum score of 20 and higher, more represented a process for changing behavior, and thus predicting the need for a strategy to change people's behavior. The fourth part was an assessment questionnaire for measuring each person's usual dietary intake using a standard Food Frequency Questionnaire (FFQ), completed by interviewing the subjects of the study, and included a list of 168 food items with a standard size. Values listed for each meal were converted to recommended daily use rates. This questionnaire measures five important food groups and different food groups such as bread and cereals group, vegetable and fruit group, milk and dairy group, meat, egg and bean group, and miscellaneous group including

sugars and oils. The information provided by the research subjects through the FFQ questionnaire was entered into specialized software N4, which provided the researcher with all the nutrients and energy consumed by the subjects. Finally, SPSS18 software (Licensed Materials-property of SPSS, Inc., an IBM company, copyright 1989, 2010 SPSS) was used to analyze the information obtained from various food sources. For the part 1 of questionnaires the researcher measured weight with a fixed weight (OMRON, DIGITAL Personal Scale, WEIGHT DISPLAY: 5-180 KG, MINIMUM DISPLAY NNIT: 0.10 KG, SN: 201705-00613F, equipped with precision pressure sensor, auto off and set to zero, made in china) and height with a fixed of fiber meter.

To design the second and third parts of the researcher-made questionnaire, after studying valid and new books and articles related to the research field, preliminary information tools were prepared and, obtaining the approval of the supervisor and faculty members of Isfahan School of Midwifery and Nursing, the preliminary questionnaire was prepared. Then, in order to determine the content validity, the process and change stages of the questionnaires, they were provided to 15 professors and specialists. The questionnaires were returned by experts after being reviewed and reaching consensus. The Content Validity Ratio (CVR) of the researcher-made questionnaire constructs was 0.56 to 0.78, and Content Validity Index (CVI) structure was 0.86 to 0.93. Cronbach's alpha coefficient for the entire questionnaire was obtained as 0.98 for the whole instrument, and 0.74 for the behavior change stages; for the domains of behavior change processes, the coefficients were as follows: 0.88 for increased self-awareness, 0.94 for dramatic relief, 0.93 for self-reassessment, 0.95 for environmental reassessment, 0.81 for social emancipation, 0.77 for self-driving, 0.88 for stimulus control, 0.87 for cross-conditionality, 0.95 for auxiliary relations, 0.82 for reinforcement of management, and 0.7 for all above coefficients. It shows that the researcher-made questionnaire is reliable enough to be performed. Validity and reliability of the fourth part of the questionnaire (FFQ) was evaluated in Iran.^[15] It was also performed and validated in a study on 740 pregnant women.^[16] Given the normal distribution of data based on the Skewness Index and Q-Q plot graph, analytical statistical tests, ANOVA, and Post-Hoc test were applied to determine relationship between stages and processes of behavior change.

Ethical considerations

Ethical considerations such as obtaining written informed consent from the participants before attending the study, data confidentiality and participants' right to leave the study whenever they liked were all respected. This study is part of a master's thesis of midwifery approved by ethics committee code of the Isfahan University of Medical Sciences (IR.MUI.REC.1395.3.836).

Results

The participants of this study were 260 overweight women with the mean (SD) age of 41 (7.89) years. The mean (SD) of their BMI was equal to 26.96 (3.32). Demographic characteristics of the participants are shown in Table 1. In terms of frequency, 18.10% of the subjects were included in pre-contemplation stage, 23.50% in contemplation stage, 17.70% in preparatory phase, 13.10% in action phase, and 27.60% in maintenance phase. Most of the subjects were in inactive phase (precontemplation, contemplation, and preparation) (59.30%), and the rest of them (40.70%) were in active phase (action and maintenance). Table 2 shows that the level of education and Body Mass Index (BMI) variables were significantly correlated with the stages of behavior change ($F_4 = 2.57, p = 0.005$), but occupation and age were not significantly correlated with these stages ($p > 0.05$). The highest number of illiterate subjects was obtained in inactive stages, and the highest number of the subjects with academic education was in active stages. Individuals with lower body mass index were also in active stages.

Table 3 shows that only carbohydrate intake was reduced from pre-contemplation to maintenance stage. And it was a difference in carbohydrate consumption and different stages of change ($p < 0.05$). Post-hoc test showed that carbohydrate intake in pre-contemplation stage was lower than maintenance stage ($p < 0.05$). Table 4 shows the results obtained from analysis of cognitive and behavioral processes related to nutrient use during upward stages of change ($p < 0.001$). Post-hoc test was used to evaluate differences between the means. Results of this test showed that mean score of cognitive and behavioral processes increased in all processes (except for helping relationships) from inactive stages of behavior change to active stages of behavior change ($p < 0.001$). In helping relationships, ANOVA showed significant difference between stages, but in the post-hoc test, there was only a significant difference between pre-contemplation and maintenance components.

Discussion

This study aimed to determine the relationship between cognitive-behavioral processes and stages of change in nutrient use in overweight women referred to health centers in Isfahan. In the present study, totally, 59.30% of the subjects were exposed to inactive stages regarding nutrient intake. These results confirm and disconfirm the results of

Table 1: Demographic characteristics of the participants

Variables	Mean (SD)	Range
Age (years)	41 (7.89)	32-59
Weight (kg)	73.27 (7.92)	54-95
Height (m)	1.59 (0.07)	1.45-1.74
BMI* (Kg/m ²)	26.99 (3.32)	25-29.97

*Body Mass Index

Table 2: Relationship between stages of behavioral change in nutrient intake and demographic characteristics

Demographic characteristics	Inactive stages of change Number (%)	Active stages of change Number (%)	Total Number (%)	Chi-square test		
				F	df	p
Job						
Housewife	94 (36.15)	99 (38.08)	193 (74.23)	1.03	1	0.450
Employed	34 (13.07)	33 (12.69)	67 (25.76)			
Education						
Elementary	48 (18.46)	1 (0.38)	49 (18.90)	2.31	2	0.011
guidance School	78 (30.00)	47 (18.07)	135 (51.90)			
High School and collegiate	20 (7.69)	56 (21.53)	76 (29.20)			
Body mass index						
25-26.9	28 (10.76)	53 (20.38)	81 (31.15)	2.57	4	0.005
27-28.9	44 (16.92)	51 (19.61)	95 (36.53)			
29-29.9	41 (15.76)	35 (13.46)	76 (29.23)			
Age						
30-49	98 (37.69)	92 (35.38)	190 (73.07)	0.03	2	0.446
50-59	31 (11.92)	39 (15.00)	70 (26.92)			

Table 3: Comparison of mean and standard deviation of nutrient intake by stages of change

Nutrient mean (SD)	Pre contemplation	Contemplation	Preparation	Action	Maintenance	Total	Test ANOVA		
							F	df	p
Protein	101.35 (48.13)	91.66 (41.63)	96.71 (44.84)	86.94 (35.49)	83.02 (46.05)	91.30 (44.15)	2.02	4	0.09
Carbohydrate	485.53 (218.94)	456.83 (192.01)	446.34 (175.88)	393.36 (222.07)	363.75 (175.76)	441.89 (190.19)	2.95	4	0.02 p=0.034
Fat	81.27 (34.47)	95.04 (64.76)	89.96 (47.88)	91.77 (57.35)	79.16 (52.63)	86.94 (31.01)	1.48	4	0.20

the previous studies. In some of the studies, the majority of individuals were in inactive stages of behavior change,^[17,18] and in some others most subjects were in active phase of consumption of fruits and vegetables.^[10,19] Possible reasons for inconsistency between results of the present study and other studies are differences in the population of the studies, socioeconomic status, and demographic characteristics of the subjects. The results showed that individuals with lower levels of body mass index and higher educational level were more active in stages of changing nutritional behavior, and these results were similar to previous studies.^[17] The results showed that more literate subjects and those with a lower body mass index are more concerned with getting nutrients. Maybe it is because these subjects are more interested in getting information about healthy diet.

Regarding to the comparison of nutrient intake with the stages of change, the results showed that there was a significant difference in carbohydrate intake during stages of behavior change. Although there was no significant difference between the stages of fat intake, the amount of fat intake in maintenance phase was lower than in pre-contemplation, contemplation, preparation, and action stages. There was no significant association between protein intake and stages of change in protein intake; these results were similar to the results of the previous studies.^[10,17] In a study, the consumption of fruits and vegetables increased in the stage of change (as no study was found about nutrient intake, the results were compared

with fruit and vegetable consumption studies). In general, as expected, when the participants moved to maintenance phase, they had a healthy diet. Only with regard to the consumption of protein the expectations were not met that is maybe because of low level of overall protein intake in the participants, which could be because of the low economic situation leading to this outcome. Concerning the use of cognitive process structures during behavior change stages, results showed a significant relationship between using cognitive processes in the context of nutrients during the stages of change.

In other words, the more we move toward the stages of change, the more will be increased the rate of using cognitive processes in relation to nutrient use, which is significant in all domains of cognitive processes. In this regard, results of this study are in line with the previous studies.^[18,19] In these studies, it was shown that processes of dramatic relief, self-reassessment, social liberation, and environmental reassessment had an upward trend from inactive to active phases.^[17] Researchers found that the use of cognitive processes in individuals was greater in preparatory, action, and maintenance stages than contemplation and pre-contemplation stages.^[18] Another study showed that individuals were more likely to use cognitive processes of behavior change in contemplation phase than the preparation phase in relation to fruit consumption. Also, with regard to consumption of vegetables, individuals in contemplation phase were found

Table 4: Mean (SD) score of cognitive and behavioral processes of healthy subjects during change stages

Process mean (SD)	Stages of behavior change					Test ANOVA		Post-hoc		
	Precontemplation	Contemplation	Preparation	Action	Maintenance	Total	F		df	p
Consciousness Raising	10.14 (2.82)	12.58 (2.73)	12.79 (3.07)	13.48 (2.99)	14.34 (3.21)	12.72 (3.31)	12.72	4	0.001	PC* < C**, p***, A****, M***** < C > PC; C < M, M > pC; C, p<0.001
Dramatic Relief	12.51 (3.73)	15.12 (3.16)	15.07 (3.13)	16.65 (2.97)	16.21 (3.59)	15.10 (3.64)	8.84	4	0.001	PC < C, P, A, M, p<0.001
Self-Re-evaluation	12.41 (3.50)	14.86 (2.97)	16.17 (2.91)	16.93 (2.74)	17.06 (2.99)	15.49 (3.48)	16.34	4	0.001	PC < C, P, A, M, p<0.001
Environmental Re-evaluation	10.79 (3.05)	13.32 (2.96)	14.47 (3.44)	15 (3.45)	15.49 (3.80)	13.89 (3.75)	13.17	4	0.001	PC < C, P, A, M, C < M, p<0.001
Social Liberation	7.72 (2.30)	9.68 (2.09)	9.46 (2.10)	10.68 (1.59)	10.88 (2.52)	9.72 (2.45)	14.09	4	0.001	PC < C, P, A, M, p < M, p<0.001
Self-Liberation	12.56 (3.38)	14.58 (2.61)	14.82 (2.93)	16.05 (2.96)	17.05 (2.39)	15.15 (3.20)	16.29	4	0.001	PC < C, P, A, M C < PC; p < M, p<0.001
Stimulus Control	12.48 (3.47)	14.64 (3.20)	14.86 (3.26)	15.55 (3.07)	17.00 (3.91)	15.02 (3.63)	5.99	4	0.001	PC < M, P < M p<0.001
Counter-Conditioning	11.95 (3.45)	13.54 (2.82)	14.66 (2.87)	15.17 (2.63)	16.62 (2.62)	14.49 (3.32)	17.07	4	0.001	PC < C, P, A, M, C, p<M, p<0.001
Helping Relationships	9.65 (3.76)	11.02 (3.32)	12.15 (3.51)	11.17 (4.54)	12.67 (4.67)	11.42 (4.13)	4.07	4	0.003	PC < M, p<0.001
Reinforcement Management	10.79 (3.38)	12.42 (2.94)	13.17 (3.01)	13.24 (3.27)	14.91 (3.63)	12.75 (3.04)	5.66	4	0.001	PC < P, A, M, p<0.001

*Precontemplation, **Contemplation, ***Preparation, **** Action, ***** Maintenance

to further use cognitive processes of behavior change compared to those in other stages.^[19] In a study on the extent of using awareness-raising processes, it was found that environmental marketing was significantly associated with fruit and vegetable consumption.^[20] In general, those in the pre-contemplation and contemplation stages are less likely to reduce their use of change processes because they are not determined to change their behavior pattern; by contrast, those in the higher stages of behavior change are more likely to try to maintain a change in their behavior and, thus, change processes will be increased in them.

Very limited number of similar studies has been conducted in Iran. Among the limitations of the mention may be made of the high number of questions and different levels of women’s understanding. If this study were an intervention, the efficiency of this model would be better demonstrated.

Conclusion

As the results of this study showed, to move subjects from the pre-contemplation stage to the contemplation stage, we can use the processes of raising awareness, theatrical relief and marketing the environment. We readily used the process of re-evaluation ourselves to get subjects through the preparation phase; we can use the processes of self-emancipation and social emancipation, and methods such as commitments, public commitments, and provision of alternatives as well as policies to increase opportunities. Additionally, social and empowerment methods can be helpful. Moreover, for those who are in the practice phase, we can use cross-conditioning processes, stimulus control through methods such as developing reinforcements, contracts, and group recognition to prevent behavior from returning to previous stages and help reach the maintenance phase. Finally, taking advantage of processes such as helpful relationships, using methods such as understanding, health educator contacts, friendly systems, and self-help groups can be used for those in the maintenance phase.

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Conflicts of interest

Nothing to declare.

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